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CASE REPORT

Y. Aoki · M. Nata · M. Hashiyada · K. Sagisaka

Sudden unexpected death in childhood due to eosinophilic myocarditis

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Abstract A 12-year-old boy with no previous serious medical history experienced abdominal discomfort and chest pains for 5 days and suddenly died. The autopsy revealed diffuse and extensive infiltration of eosinophils into the myocardium, with poorly formed granulomas and few fibrotic changes. The necrotic change was so extensive that Charcot-Leyden crystals formed. The other visceral organs had no specific pathologic changes except for mild lymphocytic infiltration with an increase in goblet cells in the bronchial areas and eosinocytosis in the blood vessels. An initial viral infection seemed to have caused subsequent eosinophil activation due to an allergic condition. Eosinophilic myocarditis is a rare cause of sudden death in apparently healthy children. Cardiac toxicity of eosinophils is, however, well established and dominates the ultimate prognosis of patients with complicated eosinophilia.

Key words Sudden death · Myocarditis · Eosinophilia · Charcot-Leyden crystals

Introduction

Hypereosinophilia, regardless of the cause, has been associated with endomyocardial lesions [1–3]. The cases of interest to forensic pathologists are those involving individuals who have no significant symptoms or known underlying causes, and suddenly collapse and die [4]. Here we present a sudden, clinically unexplained fatality in a 12-year-old boy who collapsed following a 5-day episode of minor complaints. The postmortem histopathological examination revealed marked myocardial damage with massive eosinophilic infiltration.

Y. Aoki (✉) · M. Nata · M. Hashiyada · K. Sagisaka
Department of Forensic Medicine,
Tohoku University School of Medicine,
2-1 Seiryo-machi Aoba-ku Sendai, 980-77 Japan

Case history

A 12-year-old junior high school boy complained of abdominal discomfort and because the symptoms persisted for 3 days he consulted a physician. A diagnosis of a common cold was made and a drip infusion was administered. Two days later, he complained of anterior chest pains and his condition deteriorated. He was transported to a hospital where he was pronounced dead upon arrival. His parents had been unaware of any serious illnesses or medical problems during his lifetime and records of routine health check-ups at school showed no abnormal findings.

Autopsy findings

The body was that of an oriental boy (height 137.5 cm, weight 36.7 kg) without any evidence of trauma. The pericardial sac was unremarkable and did not contain excess fluid. The heart weighed 230 g and had slippery, but firm, turbid yellow epicardial surfaces. The coronary arterial system was elastic and free of luminal narrowing and thrombi. The myocardium had diffuse yellow discoloration without significant hypertrophy. The endocardium of the right ventricle had a few whitish patches. No mural thrombosis was noted. The valve leaflets and cusps were unremarkable. The lungs (left lung 260 g, right lung 300 g) were slightly emphysematous and the pulmonary parenchyma had mild congestion. The bronchi contained a moderate amount of white foamy fluid. Histologically, diffuse and extensive eosinophilic infiltration with few fibrotic changes was found in the myocardium and epicardium of both ventricles. The myocytes were largely replaced by the prominent eosinophils (Fig. 1). No evidence of vasculitis or vascular involvement was noted. Scattered and poorly formed granulomas with histiocytes and multinucleated giant cells were also observed (Fig. 2a, b). Occasional collections of eosinophilic granules and Charcot-Leyden crystals were stained with Luna's method [5] (Fig. 2c). Scanning electron microscopical examination, which was performed on heart sections after coating with 80% platinum and 20% palladium, also disclosed eosinophils containing prominent granules and Charcot-

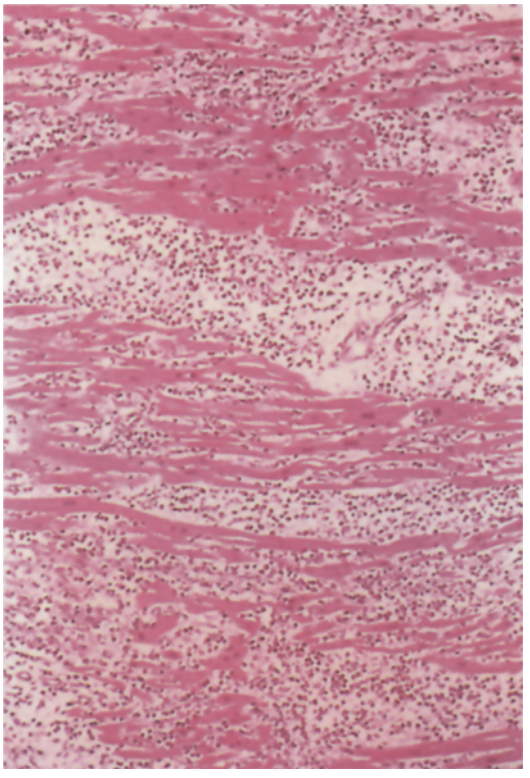

Fig. 1 Photomicrograph of the myocardium of the left ventricle. Extensive eosinophilic infiltrate replaces the myocardium. (HE, × 62)

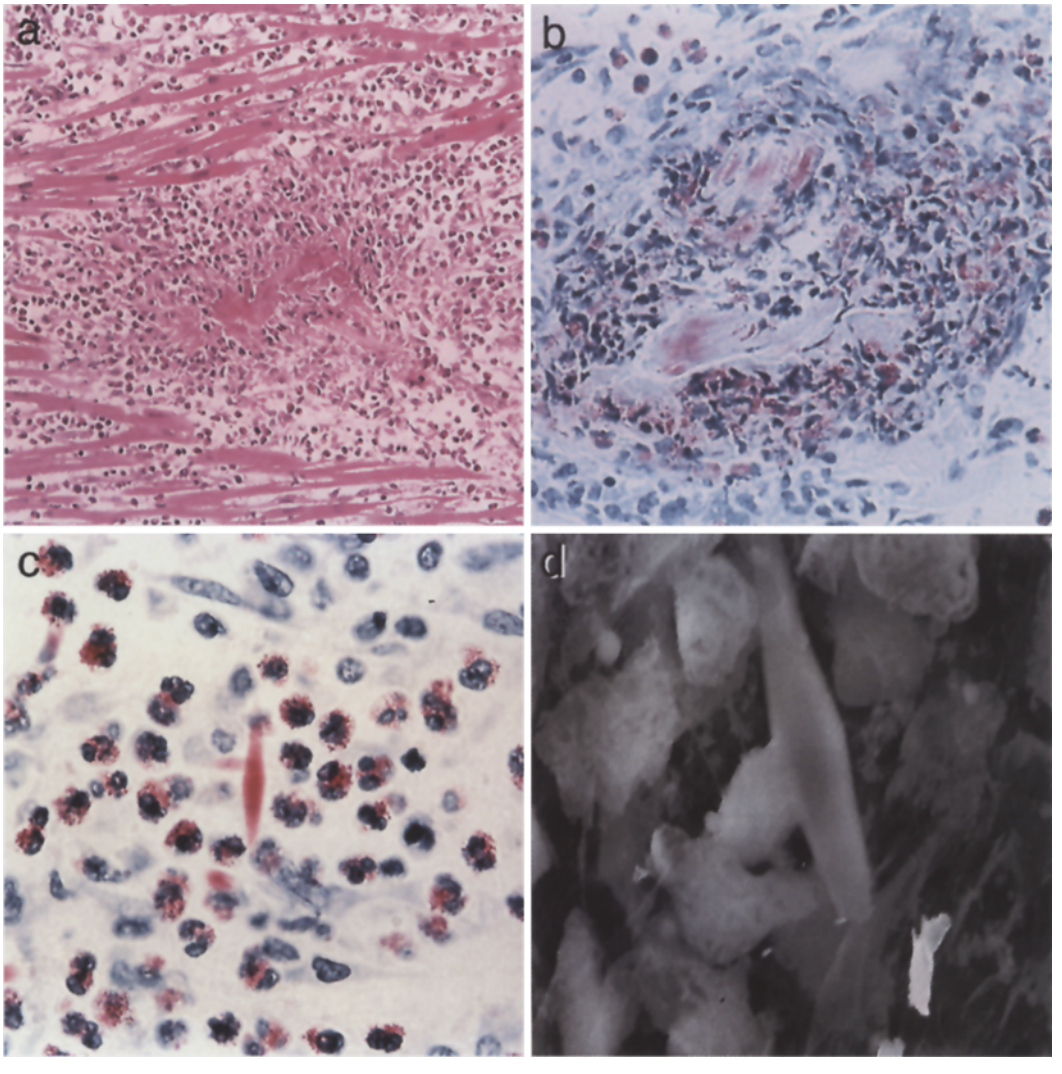

Fig. 2 a, b Photomicrographs of myocardium showing early stage of granuloma formation. Central mass of eosinophilic debris is surrounded by eosinophils, histiocytes and giant cells. Note the myocyte damage in the surrounding myocardium. (**a** HE, × 117; **b** Luna stain, × 292) **c** Charcot-Leyden crystals seen in the area surrounding a granuloma (Luna stain, × 584) **d** Charcot-Leyden crystal seen by scanning electron microscope. (× 3150)

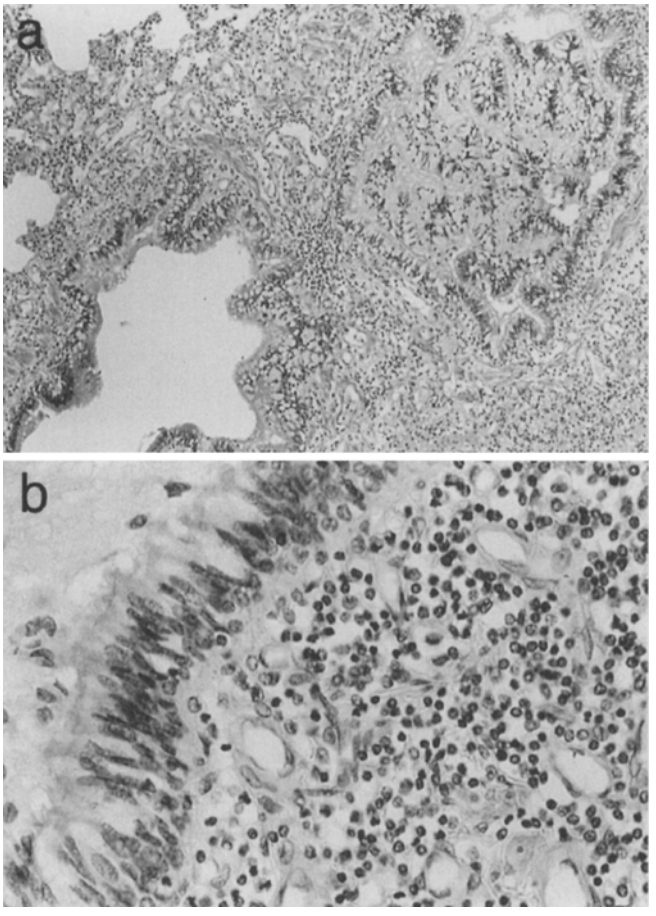

Fig. 3 Photomicrograph of the bronchial area. Lymphocytic infiltration with a few eosinophils and an increase in goblet cells. Changes of bronchial basement membranes and submucosal smooth muscles are minimal. (HE, **a** × 40, **b** × 200)

Leyden crystals (Fig. 2 d). No evidence of bacterial or parasitic infection could be demonstrated with Gram staining and periodic acid-Schiff reaction in the affected areas. Mild lymphocytic infiltration with an increase in goblet cells was found in the bronchial areas. A few eosinophils were also seen. Neither thickened bronchial basement membranes nor hypertrophic smooth muscles were observed (Fig. 3 a, b). Other visceral organs had no specific pathological changes expect for eosinocytosis in the blood vessels.

Discussion

Although hypereosinophilia was not clinically documented in the present case, scattered eosinophils found in the blood vessels of various organs probably indicated the presence of clinical hypereosinophilia. The onset of the boy's illness may have been caused by a viral infection that led to subsequent eosinophil activation. The mild histological changes in the bronchial area might reflect an underlying allergic condition. This case, therefore, would fall into the unusual category of eosinophilic endomyocardial disease characterized by acute extensive eosinophilic myocarditis and fulminant clinical deterioration [6].

The nature of the stimulating factor that attracts eosinophils into the myocardium is obscure; however, once activated, eosinophils are biochemically capable of causing cardiac damage [7–9], which often dominates the ultimate prognosis of the patient. Charcot-Leyden crystals have been considered to be a morphological sign of disease associated with eosinophilia and appear in the early phase of the disease [8, 9]. Another conspicuous histological feature of this case was the granulomatous change with histiocytes and multinucleated giant cells formed to scavenge the eosinophilic products and other debris. These processes seemed to be essentially identical with foreign body granuloma formation [9]. The overall histological findings of the myocardium in the present case would be consistent with the 5-day history of the illness.

The literature on sudden death in childhood from eosinophilic myocarditis of unknown etiology is limited in Japan. Ishide et al. [10] reviewed 14 autopsy cases reported in Japan from 1965 to 1985 and failed to find any fatality under 20 years old or any cases of sudden death. Even mild viral infections, however, can trigger eosinophilic activation when there is an allergic diathesis. The clinical symptoms of acute myocarditis are usually minor and non-specific, such as fever and palpitation, but the initial manifestations may include sudden cardiovascular collapse. Consequently, investigation of the cause of death is sometimes left to the forensic pathologists [11]. Echocardiography should be seriously considered as a diagnostic procedure for children with eosinophilia [12]. Postmortem examination using Luna's stain, which is a less complicated method, may also be of help for estimation of the pathological stage.

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